Biodiversity Data Journal 2: e3999
doi: 10.3897/BDJ.2.e3999

open access

Taxonomic paper

Checklist of butterflies (Insecta: Lepidoptera) from Serra do Intendente State Park - Minas Gerais, Brazil

Izabella Nery†, Natalia Carvalho†, Henrique Paprocki†

† Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brazil

Corresponding author: Henrique Paprocki (paprocki@pucminas.br)

Academic editor: Bong-Kyu Byun

Received: 28 Aug 2014 | Accepted: 10 Nov 2014 | Published: 25 Nov 2014

Citation: Nery I, Carvalho N, Paprocki H (2014) Checklist of butterflies (Insecta: Lepidoptera) from Serra do Intendente State Park - Minas Gerais, Brazil. Biodiversity Data Journal 2: e3999. doi: 10.3897/BDJ.2.e3999

Abstract

In order to contribute to the butterflies' biodiversity knowledge at Serra do Intendente State Park - Minas Gerais, a study based on collections using Van Someren-Rydon traps and active search was performed. In this study, a total of 395 butterflies were collected, of which 327 were identified to species or morphospecies. 263 specimens were collected by the traps and 64 were collected using entomological hand-nets; 43 genera and 60 species were collected and identified.

Keywords

Espinhaço Mountain Range, Arthropoda, frugivorous butterflies, Peixe Tolo, inventory

Introduction

The Lepidoptera is comprised of butterflies and moths; it is one of the main orders of insects which has approximately 157,424 described species (Freitas and Marini-Filho 2011, Zhang 2011). The butterflies, object of this study, have approximately 19,000 species described worldwide (Heppner 1991). The occurrence of 3,300 species is estimated for

© Nery I et al. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Brazil, with more than 1,600 for Minas Gerais state (Casagrande et al. 1998). The group of butterflies studied belong to the superfamilies Papilionoidea and Hesperioidea and are subdivided into six families: Hesperiidae (Hesperioidea) and Papilionidae, Pieridae, Lycaenidae, Riodionidae, and Nymphalidae (Papilionoidea) (Brown Jr. and Freitas 1999).

These insects are characterized as holometabolous, terrestrial, and diurnal. They are plant material chewers in the larval stage and liquid suckers in adulthood (Heppner 1991). Butterflies are insects that inhabit almost all terrestrial natural ecosystems (Freitas et al. 2003) and the presence of these creatures in a habitat is related to the availability of food resources and conditions such as temperature, relative humidity, and sunlight incidence (Brown Jr. and Hutchings 1997). They are divided into two guilds, according to adults' dietary habits: the nectarivorous and those who feed on fermented fruit, excrements, and exudates of decaying plants and animals (Uehara-Prado et al. 2007).

Butterflies are important indicators of environmental quality, because they are diverse, can be easily viewed, captured, identified, and manipulated by researchers (Mielke and Casagrande 1997). They are present throughout the year, and exhibit rapid responses regarding environmental disturbances (Öckinger et al. 2006). The larvae are considered pests of agricultural crops causing important damage leading to economic loss. However, they are important pollinators in adulthood (Isehard and Romanowski 2004, Triplehorn and Johnson 2011).

There are few studies about butterfly biodiversity in the Espinhaço Biosphere Reserve (Wilson 1997). The knowledge of Lepidoptera biodiversity in Minas Gerais, is still scarce (Casagrande et al. 1998). There is no published literature about butterfly biodiversity and distribution for the Espinhaço mountain range within Minas Gerais. The number of Lepidoptera checklists for Brazil is still very small and this effort contributes to a better understanding of biodiversity distribution in the country.

This work inventories butterflies on a state conservation area called Serra do Intendente State Park (PESI), Minas Gerais, Brazil.

Materials and methods

Study Site

The study was conducted in the region of Serra do Espinhaço, more precisely, within the Serra do Intendente State Park (Fig. 2) and the Peixe Tolo Natural Reserve, Minas Gerais (Fig. 1). The park features approximately 13,508 ha and is an important area for Espinhaço mountains biodiversity conservation.

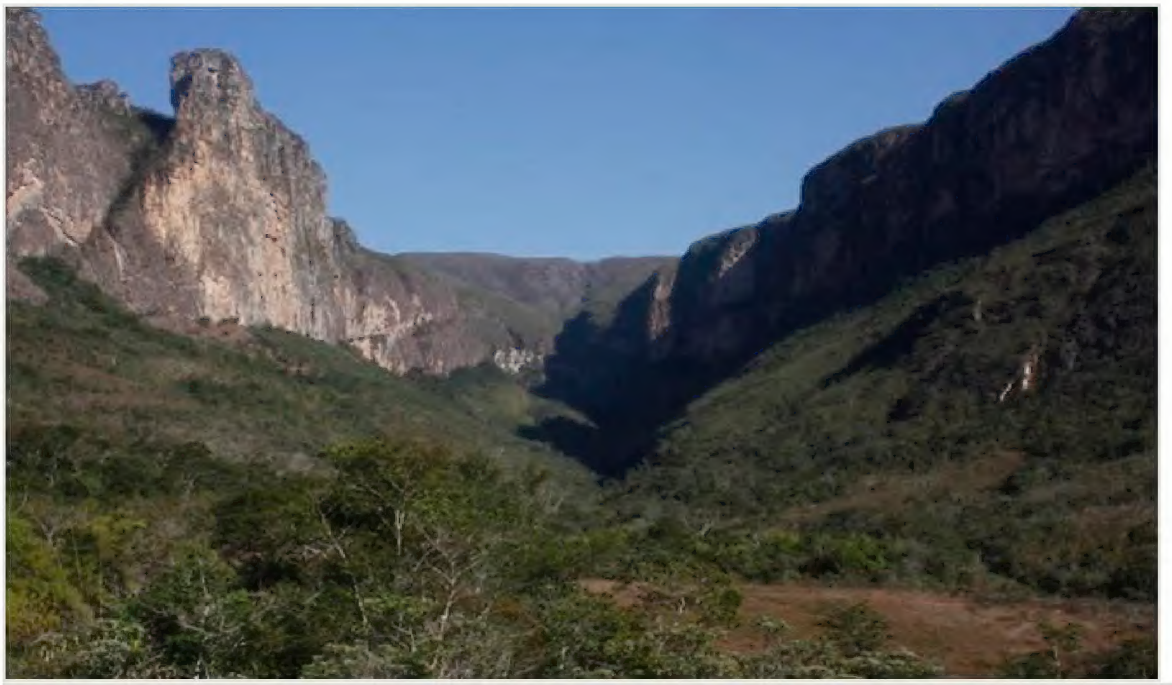

Figure 1.

Study area - Peixe Tolo Natural Reserve and Serra do Intendente State park, Minas Gerais, Brazil.

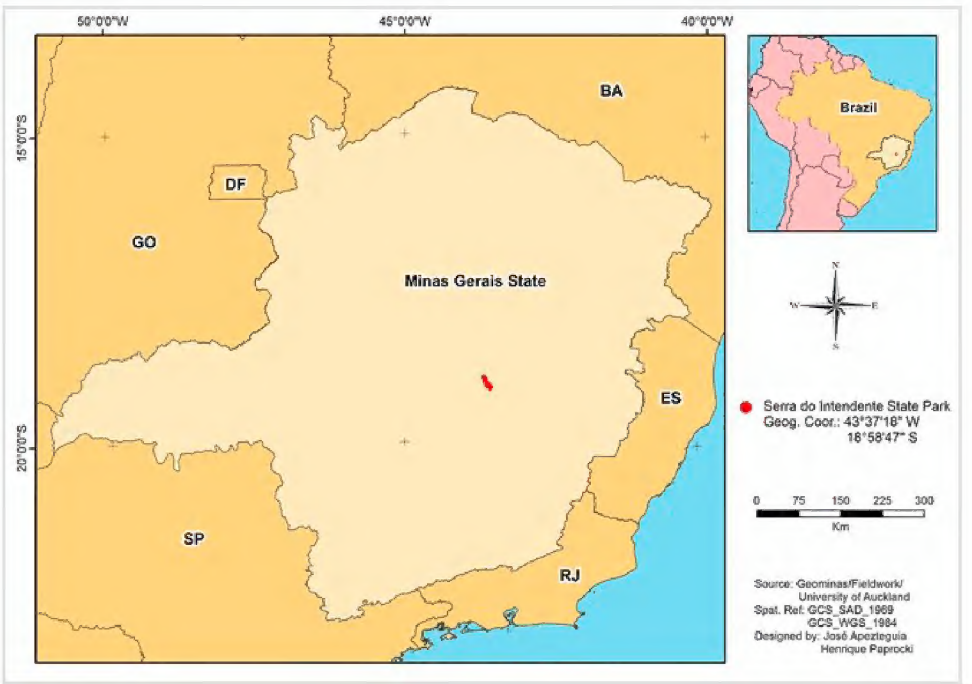

Figure 2.

Location map of Serra do Intendente State Park, Minas Gerais, Brazil.

The climate is mesothermal, characterized by mild, humid summers and dry, cold winters. The average annual rainfall is 1,600 mm. The annual mean temperature is 18, 7ºC (Araujo et al. 2005, Silva et al. 2009). The predominant topography is the mountainous escarpment, mixed with rocky outcrops. The vegetation is mosaic and it is characterized by the presence of striking landscapes of three biomes: Atlantic Forest, Caatinga, and Cerrado (Andrade and Domingues 2013).

Data Collection

The collections began in April 2012 and were completed in February of 2013. During this period four collections (two in the rainy season and two in the dry season) were performed. Each collection was performed for five days. The study area was divided into two areas throughout the Peixe Tolo River basin and in each area, forty Van Someren-Rydon traps were distributed. Twenty traps were located on the right bank and other twenty on the left bank of the Peixe Tolo River (Fig. 3). In these traps, baits made of a mixture of ripe banana and sugarcane syrup was used; the solution was left fermenting for forty-eight hours before exposure in the traps.

Figure 3.

Photographie of sampling point with replica traps in Serra do Intendente State park, Minas Gerais, Brazil.

Throughout the collection period, active search of butterflies was performed in order to capture non-frugivorous butterflies. The specimens collections were conducted throughout the day, starting around 10am until 3pm. The butterflies captured were immediately killed through abdomen compression in order to avoid damage that could compromise identification.

Data analysis

The collected material was mounted, identified and labeled in the PUC Minas Natural Sciences Museum entomological collection laboratory. The identification of the individuals was made using Devries (1997), Freitas et al. (2003), D'Abrera (1987b), D'Abrera (1987a), D'Abrera (1988) and the website Butterflies of America (accessible at http://butterfliesofamerica.com/). Genera and species were confirmed by Dr. André Freitas, from the Department of Animal Biology, Universidade Estadual de Campinas. Furthermore, a comparison with available identified species in the Lepidoptera collection in the Invertebrates Laboratory (PUC Minas) was performed.

Data resources

In this study 394 individuals were captured, and 327 were identified. Sixty-seven individuals were not identified to genus or species due to bad specimen conditions or incipient systematics.

The families represented in this study were: Nymphalidae, Pieridae, Hesperiidae, Lycaenidae, Papilionidae and Riodinidae. A total of 299 individuals belonging to the Nymphalidae, 15 from the Pieridae, four from the Hesperiidae, four from the Lycaenidae, three from the Papilionidae, and one species from the Riodinidae.

A total of 263 butterflies were collected in traps and 63 using entomological hand-nets. The collections gathered specimens belonging to 43 genera and 60 species (Table 1). During the rainy seasons 181 individuals were collected in which 177 were collected by traps and 4 by entomological hand-nets (Table 2). In the dry seasons 145 individuals were collected: of those, 86 were collected in traps and 59 by entomological hand-nets (Table 3).

Table 1.

List of species collected in traps and active search in Serra do Intendente State Park, Minas Gerais, Brazil.

Species	Traps	Active Search
Adelpha pleasure (Hübner, 1823)8	1	0
Adelotypa malca (Shaus, 1902)	0	1
Archaeoprepona demophon (Linnaeus, 1758)	2	0
Autochton zarex (Hübner, 1818)	1	0
Anartia amathea (Linnaeus, 1758)	0	1
Ascia monuste (Linnaeus, 1764)	0	3
Blepolenis batea (Hübner, 1821)	1	1
Caligo arisbe Hübner, 1820	1	0
Callicore sorana (Godart, 1832)	3	0
Catonephele acontius (Linnaeus, 1771)	1	0
Colobura dirce (Linnaeus, 1764)	4	0
Dryas iulia (Fabricius, 1775)	0	2
Euptychoides castrensis (Shaus, 1902)	53	2
Eryphanis reevesii (Doubleday, 1849)	0	0
Eresia lansdorfi (Godart, 1819)	0	1
Eurema albula (Cramer, 1775)	0	3
Eurema elathea (Cramer, 1777)	0	2
Eurema phiale (Cramer, 1775)	0	6
Eurema sp.	0	1

Godartiana muscosa (Butler, 1870)	11	0
Hamadryas amphinome (Linnaeus, 1767)	6	0
Hamadryas februa (Hübner, 1816/24)	3	0
Hamadryas feronia (Linnaeus, 1758)	12	2
Heliconius besckei (E. Ménétriés, 1857)	3	1
Heliconius erato (Linnaeus, 1764)	1	1
Heliconius ethilla (Godart, 1819)	0	2
Heliopetes omrina (Butler, 1870)	0	1
Junonia evarete (Cramer, 1782)	0	1
Junonia genoveva (Cramer, 1782)	0	1
Leptotes cassius (Cramer, 1775)	0	2
Leptotes sp.	0	1
Marpesia chiron (Fabricius, 1775)	0	1
Memphis moruus (Fabricius, 1775)	12	0
Memphis otrere (Hübner, 1825)	1	0
Memphis ryphea (Geyer, 1834)	1	0
Memphis sp.	1	0
Morpho helenor (Cramer, 1782)	50	1
Narope cyllarus (Westwood, 1851)	3	0
Opsiphanes cassiae (Linnaeus, 1758)	2	0
Opsiphanes quitera (Stoll, 1782)	2	0
Opoptera syme (Hübner, 1822/26)	2	0
Pareuptychia ocirrhoe (Fabricius, 1777)	2	0
Paryphthimoides undulata (Butler, 1867)	1	0
Prepona laertes (Hübner, 1811)	1	0
Pseudolycaena marsyas (Linnaeus, 1758)	0	1
Pyrgus orcus (Stoll, 1780)	0	2
Siderone galanthis (Cramer, 1775/76)	1	0
Siproeta stelenes (Linnaeus, 1758)	0	1
Smyrna blomfildia (Fabricius, 1781)	2	0
Staphylus sp.	0	3
Taygetis acuta (Weymer, 1911)	1	0
Taygetis laches (Fabricius, 1793)	15	0
Taygetis mermeria (Cramer, 1779)	4	0
Taygetis sylvia (Bates, 1866)	1	0
Temenis laothoe (Cramer, 1779)	1	0
Telenassa teletusa (Godart, 1823)	0	16

Urbanus sp.	0	1
Yphthimoides straminea (Butler, 1867)	51	1
Zaretis isidora (Cramer, 1779/80)	5	0
Zaretis itys (Cramer, 1777)	1	0

Table 2.

List of species collected during rainy seasons in Serra do Intendente State Park, Minas Gerais, Brazil.

Species	Traps	Active Search
Adelpha pleasure (Hübner, 1823)	1	0
Adelotypa malca (Shaus, 1902)	0	1
Archaeoprepona demophon (Linnaus, 1758)	1	0
Autochton zarex (Hübner, 1818)	1	0
Anartia amathea (Linnaeus, 1758)	0	0
Ascia monuste (Linnaeus, 1764)	0	0
Blepolenis batea (Hübner, 1821)	0	0
Caligo arisbe Hübner, 1820	3	0
Callicore sorana (Godart, 1832)	1	0
Catonephele acontius (Linnaeus, 1771)	1	0
Colobura dirce (Linnaeus, 1764)	4	0
Dryas iulia (Fabricius, 1775)	0	0
Euptychoides castrensis (Shaus, 1902)	25	0
Eryphanis reevesii (Doubleday, 1849)	0	0
Eresia lansdorfi (Godart, 1819)	0	0
Eurema albula (Cramer, 1775)	0	0
Eurema elathea (Cramer, 1777)	0	0
Eurema phiale (Cramer, 1775)	0	0
Eurema sp.	0	0
Godartiana muscosa (Butler, 1870)	9	0
Hamadryas amphinome (Linnaus, 1767)	6	0
Hamadryas februa (Hübner, 1816/24)	2	0
Hamadryas feronia (Linnaeus, 1758)	7	0
Heliconius besckei (E. Ménétriés, 1857)	1	0
Heliconius erato (Linnaeus, 1764)	0	0
Heliconius ethilla (Godart, 1819)	0	0
Heliopetes omrina (Butler, 1870)	0	0
Junonia evarete (Cramer, 1782)	0	0

Junonia genoveva (Cramer, 1782)	0	0
Leptotes cassius (Cramer, 1775)	0	2
Leptotes sp.	0	1
Marpesia chiron (Fabricius, 1775)	0	0
Memphis moruus (Fabricius, 1775)	6	0
Memphis otrere (Hübner, 1825)	0	0
Memphis ryphea (Geyer, 1834)	1	0
Memphis sp.	1	0
Morpho helenor (Cramer, 1782)	30	0
Narope cyllarus (Westwood, 1851)	1	0
Opsiphanes cassiae (Linnaeus, 1758)	2	0
Opsiphanes quitera (Stoll, 1782)	1	0
Opoptera syme (Hübner, 1822/26)	2	0
Pareuptychia ocirrhoe (Fabricius, 1777)	2	0
Paryphthimoides undulata (Butler, 1867)	0	0
Prepona laertes (Hübner, 1811)	0	0
Pseudolycaena marsyas (Linnaeus, 1758)	0	0
Pyrgus orcus (Stoll, 1780)	0	0
Siderone galanthis (Cramer, 1775/76)	0	0
Siproeta stelenes (Linnaeus, 1758)	0	0
Smyrna blomfildia (Fabricius, 1781)	2	0
Staphylus sp.	0	0
Taygetis acuta (Weymer, 1911)	1	0
Taygetis laches (Fabricius, 1793)	14	0
Taygetis mermeria (Cramer, 1779)	3	0
Taygetis sylvia (Bates, 1866)	0	0
Temenis laothoe (Cramer, 1779)	1	0
Telenassa teletusa (Godart, 1823)	0	0
Urbanus sp.	0	0
Yphthimoides straminea (Butler, 1867)	47	0
Zaretis isidora (Cramer, 1779/80)	1	0
Zaretis itys (Cramer, 1777)	0	0

Table 3.

List of species collected during the dry seasons in Serra do Intendente State Park, Minas Gerais, Brazil

Species	Traps	Active Search
Adelpha pleasure (Hübner, 1823)	0	0
Adelotypa malca (Shaus, 1902)	0	0
Archaeoprepona demophon (Linnaus, 1758)	1	0
Autochton zarex (Hübner, 1818)	0	0
Anartia amathea (Linnaeus, 1758)	0	1
Ascia monuste (Linnaeus, 1764)	0	3
Blepolenis batea (Hübner, 1821)	1	1
Caligo arisbe Hübner, 1820	0	0
Callicore sorana (Godart, 1832)	0	0
Catonephele acontius (Linnaeus, 1771)	0	0
Colobura dirce (Linnaeus, 1764)	0	0
Dryas iulia (Fabricius, 1775)	0	2
Euptychoides castrensis (Shaus, 1902)	28	2
Eryphanis reevesii (Doubleday, 1849)	0	0
Eresia lansdorfi (Godart, 1819)	0	1
Eurema albula (Cramer, 1775)	0	3
Eurema elathea (Cramer, 1777)	0	2
Eurema phiale (Cramer, 1775)	0	6
Eurema sp.	0	1
Godartiana muscosa (Butler, 1870)	2	0
Hamadryas amphinome (Linnaeus, 1767)	0	0
Hamadryas februa (Hübner, 1816/24)	1	0
Hamadryas feronia (Linnaeus, 1758)	5	2
Heliconius besckei (E. Ménétriés, 1857)	2	1
Heliconius erato (Linnaeus, 1764)	1	1
Heliconius ethilla (Godart, 1819)	0	2
Heliopetes omrina (Butler, 1870)	0	1
Junonia evarete (Cramer, 1782)	0	1
Junonia genoveva (Cramer, 1782)	0	1
Leptotes cassius (Cramer, 1775)	0	0
Leptotes sp.	0	0
Marpesia chiron (Fabricius, 1775)	0	1
Memphis moruus (Fabricius, 1775)	6	0

Memphis otrere (Hübner, 1825)	1	0
Memphis ryphea (Geyer, 1834)	0	0
Memphis sp.	0	0
Morpho helenor (Cramer, 1782)	20	1
Narope cyllarus (Westwood, 1851)	2	0
Opsiphanes cassiae (Linnaeus, 1758)	0	0
Opsiphanes quitera (Stoll, 1782)	1	0
Opoptera syme (Hübner, 1822/26)	0	0
Pareuptychia ocirrhoe (Fabricius, 1777)	0	0
Paryphthimoides undulata (Butler, 1867)	1	0
Prepona laertes (Hübner, 1811)	1	0
Pseudolycaena marsyas (Linnaeus, 1758)	0	1
Pyrgus orcus (Stoll, 1780)	0	2
Siderone galanthis (Cramer, 1775/76)	1	0
Siproeta stelenes (Linnaeus, 1758)	0	1
Smyrna blomfildia (Fabricius, 1781)	0	0
Staphylus sp.	0	3
Taygetis acuta (Weymer, 1911)	0	0
Taygetis laches (Fabricius, 1793)	1	0
Taygetis mermeria (Cramer, 1779)	1	0
Taygetis sylvia (Bates, 1866)	1	0
Temenis laothoe (Cramer, 1779)	0	0
Telenassa teletusa (Godart, 1823)	0	16
Urbanus sp.	0	1
Yphthimoides straminea (Butler, 1867)	4	1
Zaretis isidora (Cramer, 1779/80)	4	0
Zaretis itys (Cramer, 1777)	4	0

Checklist of butterflies (Insecta: Lepidoptera) from Serra do Intendente State Park - Minas Gerais, Brazil

Adelpha pleasure (Hübner, 1823)

- Encyclopedia of Life http://eol.org/pages/4090956/overview

Adelotypa malca (Shaus, 1902)

- Butterflies of America http://www.butterfliesofamerica.com/L/adelotypa_malca.htm

Archaeoprepona demophon (Linnaus, 1758)

- Encyclopedia of Life http://eol.org/pages/168926/overview
- Butterflies of America http://butterfliesofamerica.com/L/archaeoprepona_d_demophoon_types.htm

Autochton zarex (Hübner,1818)

- Encyclopedia of Life http://eol.org/pages/181967/overview

Anartia amathea (Linnaus, 1758)

- Encyclopedia of Life http://eol.org/pages/159066/overview
- Butterflies of America http://butterfliesofamerica.com/anartia_a_amathea_types.htm

Ascia monuste (Linnaus, 1764)

- Encyclopedia of Life http://eol.org/pages/172859/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/ascia_m_monuste_types.htm

Blepolenis batea (Hübner, 1821)

- Encyclopedia of Life http://eol.org/pages/11555451/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/blepolenis_b_batea_types.htm

Caligo arisbe Hübner, 1820

- Encyclopedia of Life http://eol.org/pages/149491/overview
- Butteflies of America http://www.butterfliesofamerica.com/L/caligo_a_arisbe_types.htm

Callicore sorana (Godart, 1832)

- Encyclopedia of Life http://eol.org/pages/4090003/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/callicore_s_sorana_types.htm

Catonephele acontius (Linnaus, 1771)

- Encyclopedia of Life http://eol.org/pages/163630/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/catonephele_a_acontius_types.htm

Colobura dirce (Linnaus, 1764)

- Encyclopedia of Life http://eol.org/pages/156101/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/colobura_d_dirce_types.htm

Dryas iulia (Fabricius, 1775)

- Encyclopedia of Life http://eol.org/pages/158533/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/dryas_i_iulia_types.htm

Euptychoides castrensis (Shaus, 1902)

- Encyclopedia of Life http://eol.org/pages/12083351/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/euptychoides_castrensis_types.htm

Eryphanis reevesii (Doubleday, 1849)

- Encyclopedia of Life http://eol.org/pages/146531/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/eryphanis_r_reevesii_types.htm

Eresia lansdorfi (Godart, 1819)

- Encyclopedia of Life http://eol.org/pages/160030/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/eresia_lansdorfi_types.htm

Eurema albula (Cramer, 1775)

- Encyclopedia of Life http://eol.org/pages/176703/overview
- Butterflies of America http://butterfliesofamerica.com/L/eurema_a_albula_types.htm

Eurema elathea (Cramer, 1777)

- Encyclopedia of Life http://eol.org/pages/178177/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/eurema_e_elathea.htm

Eurema phiale (Cramer, 1775)

- Encyclopedia of Life http://eol.org/pages/184116/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/eurema_p_phiale_types.htm

Eurema sp.

- Encyclopedia of Life http://eol.org/pages/19949/overview

Godartiana muscosa (Butler, 1870)

- Encyclopedia of Life http://eol.org/pages/961111/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/godartiana_muscosa_types.htm

Hamadryas amphinome (Linnaus, 1767)

- Encyclopedia of Life http://eol.org/pages/166283/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/hamadryas_a_amphinome_types.htm

Hamadryas februa (Hübner, 1816/24)

- Encyclopedia of Life http://eol.org/pages/166346/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/hamadryas_f_februa_types.htm

Hamadryas feronia (Linnaus, 1758)

- Encyclopedia of Life http://eol.org/pages/166361/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/hamadryas_f_feronia_types.htm

Heliconius besckei (E. Ménétriés, 1857)

- Encyclopedia of Life http://eol.org/pages/155098/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/heliconius_besckei_types.htm

Heliconius erato (Linnaus, 1764)

- Encyclopedia of Life http://eol.org/pages/151378/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/heliconius_e_erato_types1.htm

Heliconius ethilla (Godart, 1819)

- Barcode of Life http://eol.org/pages/157369/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/heliconius_e_ethilla_types.htm

Heliopetes omrina (Butler, 1870)

- Encyclopedia of Life http://eol.org/pages/185550/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/heliopetes_omrina_types.htm

Junonia evarete (Cramer, 1782)

- Encyclopedia of Life http://eol.org/pages/162840/overview
- Butterflies of America http://www.butterfliesofamerica.com/junonia_e_evarete_types.htm

Junonia genoveva (Cramer, 1782)

- Encyclopedia of Life http://eol.org/pages/157257/overview
- Butterflies of America http://www.butterfliesofamerica.com/junonia_g_genoveva_types.htm

Leptotes cassius (Cramer, 1775)

- Encyclopedia of Life http://eol.org/pages/264320/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/leptotes_c_cassius_types.htm

Leptotes sp.

- Encyclopedia of Life http://eol.org/pages/33170/overview

Marpesia chiron (Fabricius, 1775)

- Encyclopedia of Life http://eol.org/pages/165801/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/marpesia_c_chiron_types.htm

Memphis moruus (Fabricius, 1775)

- Encyclopedia of Life http://eol.org/pages/29501563/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/memphis_m_moruus_types.htm

Memphis otrere (Hübner, 1825)

- Encyclopedia of Life http://eol.org/pages/29514890/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/memphis_otrere_types.htm

Memphis ryphea (Geyer, 1834)

- Encyclopedia of Life http://eol.org/pages/23311886/overview

Memphis sp.

- Encyclopedia of Life http://eol.org/pages/19988/overview

Morpho helenor (Cramer, 1782)

- Encyclopedia of Life http://eol.org/pages/138539/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/morpho_h_helenor_types.htm

Narope cyllarus (Westwood, 1851)

- Encyclopedia of Life http://eol.org/pages/148144/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/narope_cyllarus_types.htm

Opsiphanes cassiae (Linnaus, 1758)

- Encyclopedia of Life http://eol.org/pages/150133/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/opsiphanes_c_cassiae_types.htm

Opsiphanes quiteria (Stoll, 1782)

- Encyclopedia of Life http://eol.org/pages/147972/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/opsiphanes_q_quiteria_types.htm

Opoptera syme (Hübner, 1822/26)

- Encyclopedia of Life http://eol.org/pages/148836/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/opoptera_syme_types.htm

Pareuptychia ocirrhoe (Fabricius, 1777)

- Encyclopedia of Life http://eol.org/pages/138517/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/pareuptychia_o_ocirrhoe.htm

Paryphthimoides undulata (Butler, 1867)

- Butterflies of America http://www.butterfliesofamerica.com/L/paryphthimoides_undulata_types.htm

Prepona laertes (Hübner, 1811)

- Encyclopedia of Life http://eol.org/pages/168780/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/prepona_l_laertes_types.htm

Pseudolycaena marsyas (Linnaus, 1758)

- Encyclopedia of Life http://eol.org/pages/261603/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/pseudolycaena_marsyas_types.htm

Pyrgus orcus (Stoll, 1780)

- Encyclopedia of Life http://eol.org/pages/183872/overview
- Butterflies of America http://butterfliesofamerica.com/L/pyrgus_orcus_types.htm

Siderone galanthis (Cramer, 1775/76)

- Encyclopedia of Life http://eol.org/pages/170707/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/siderone_g_galanthis_types.htm

Siproeta stelenes (Linnaus, 1758)

- Encyclopedia of Life http://eol.org/pages/4068082/overview
- Butterflies of America http://butterfliesofamerica.com/siproeta_s_stelenes_types.htm

Smyrna blomfildia (Fabricius, 1781)

- Encyclopedia of Life http://eol.org/pages/164148/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/smyrna_b_blomfildia_types.htm

Staphylus sp.

- Encyclopedia of Life http://eol.org/pages/20450/overview

Taygetis acuta (Weymer, 1911)

- Encyclopedia of Life http://eol.org/pages/147615/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/taygetis_acuta_types.htm

Taygetis laches (Fabricius, 1793)

- Encyclopedia of Life http://eol.org/pages/146471/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/taygetis_l_laches_types.htm

Taygetis mermeria (Cramer, 1779)

- Encyclopedia of Life http://eol.org/pages/139915/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/taygetis_m_mermeria_types.htm

Taygetis sylvia (Bates, 1866)

- Encyclopedia of Life http://eol.org/pages/146462/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/taygetis_sylvia_types.htm

Temenis laothoe (Cramer, 1779)

- Encyclopedia of Life http://eol.org/pages/164154/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/temenis_l_laothoe_types.htm

Telenassa teletusa (Godart, 1823)

- Encyclopedia of Life http://eol.org/pages/153045/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/telenassa_t_teletusa_types.htm

Urbanus sp.

- Encyclopedia of Life http://eol.org/pages/20632/overview

Yphthimoides straminea (Butler, 1867)

- Encyclopedia of Life http://eol.org/pages/40034120/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/yphthimoides_straminea_types.htm

Zaretis isidora (Cramer, 1779/80)

- Encyclopedia of Life http://eol.org/pages/36076631/overview
- Butterflies of America http://www.butterfliesofamerica.com/L/zaretis_isidora_types.htm

Zaretis itys (Cramer, 1777)

- Encyclopedia of Life http://www.butterfliesofamerica.com/L/zaretis_isidora_types.htm
- Butterflies of America http://butterfliesofamerica.com/zaretis_i_itys_types.htm

Discussion

The present study showed greater richness of species than the studies performed by Santana (2005), Rosa et al. (2011), Pedrotti et al. (2011), Favretto (2012), Ramos Soares et al. (2012). However, compared with records for several Brazilian states such as recorded by Isehard and Romanowski (2004), Marchiori and Romanowski (2006), Emery et al. (2006), Dessuy and Morais (2007), Pinheiro et al. (2008), Isehard et al. (2010), Ritter et al. (2011), Zacca and Bravo (2012), and Bogiani et al. (2012), the number of species found is lower. This fact could very well be explained by the sampled area size and sampling effort (Table 4).

Table 4.

Comparison of Lepidoptera inventories with published checklists in Brazil

Study	State (Brazil)	Biome	Sampled area	Richness
Nery et al. 2014 (this study)	Minas Gerais	Caatinga,Cerrado and Atlantic Forest	13,447	60
Bogiani et al. 2012	Mato Grosso do Sul	Cerrado	60,5	62
Dolibaina et al. 2011	Paraná	Atlantic Forest	5,000	689
Silva et al. 2007	Minas Gerais	Cerrado	7	91
Bonfantti et al. 2011	Paraná	Atlantic Forest	27	166
Paluch et al. 2011	Pernabuco	Atlantic Forest	359	197
Mielke et al. 2008	Distrito Federal	Cerrado	Not applicable	335
Favretto 2012	Santa Catarina	Atlantic Forest	Not applicable	58
Marchiori and Romanowski 2006	Rio Grande do Sul	Steppe Savanna	1,617.14	97
Emery et al. 2006	Distrito Federal	Cerrado	Notpplicable	504
Pinheiro et al. 2008	Distrito Federal	Cerrado	50,5	128
Mielke and Casagrande 1997	São Paulo	Atlantic Forest	33,845	426
Silva et al. 2012	Minas Gerais	Cerrado and Atlantic Forest	151	45
Isehard et al. 2007	Rio Grande do Sul	Atlantic Forest	1,606.60	149
Santana 2005	Mato Grosso	Cerrado and Atlantic Forest	480.02	69
Ramos Soares et al. 2012	Minas Gerais	Atlantic Forest	18.2	78
Isehard et al. 2010	Rio Grande do Sul	Atlantic Forest	1,606.60	277
Isehard and Romanowski 2004	Rio Grande do Sul	Atlantic Forest	54,600	292
Pinheiro and Emery 2006	Distrito Federal	Cerrado	25,000	507
Brown Jr. and Freitas 2000a	Espirito Santo	Atlantic Forest	Not applicable	297
Motta 2002	Minas Gerais	Cerrado	30	251
Silva et al. 2010	Minas Gerais	Atlantic Forest	36,970	83

In southeastern Brazil Mielke and Casagrande (1997) recorded 426 species in an area of 33,000 ha,for the Morro do Diabo State Park - São Paulo whereas the study by Brown Jr. and Freitas (2000a) in Santa Tereza – Espirito Santo, 297 species were registered in an area of 332,000 ha. In the state of Minas Gerais, Motta (2002) recorded 251 species in an area of 30 hectares in a region of Uberlândia; Silva et al. (2007) registred 91 species of butterflies in the PUC Minas Forest located in Belo Horizonte, in 7.0 ha; Ramos Soares et al. (2012) found 78 species in Americo Rene Giannetti Municipal Park with 0,018 ha.

The Nymphalidae was the family with greatest richness; this diversity can be explained by the fact that this family has great diversity in morphology and habits, as well as in environments with varying vegetation types (Brown Jr. and Freitas 1999) such as found in the Serra do Intendente State Park and the Peixe Tolo Natural Reserve.

In this study, the largest number of individuals collected (145) belongs to the subfamily Satyrinae. This family is important in analyses of disturbance studies (Devries and Walla 2001), in addition to being excellent predictors of the butterfly fauna of the Atlantic Forest (Brown Jr. and Freitas 2000b). From this subfamily, 12 individuals belonging to the *Taygetis laches* species were captured that has greater preference for more urbanly impacted environments (Silva et al. 2007).

Eurema albula and *Eurema elathea*, also registered in this site, have cosmopolitan habits and great adaptations for disturbed areas (Isehard et al. 2007, Bogiani et al. 2012). It is important to mention that *Morpho helenor*, which was well sampled – 51 individuals (Table 1), disappears quickly when severe disturbances and size reduction of forests occur (Santana 2005). These data demonstrate that the region could be severely impacted at some sites.

Morpho helenor, *Siproeta stelenes*, *Heliconius erato*, and *Heliconius ethilla* coincided with the study realized at the University Campus Darcy Ribeiro, in an urbanized area in the Federal District (Pinheiro et al. 2008). These are typical species of riparian areas, a characteristic of the sample site. *Euptychoides castrensis* is found in abundance in tropical rain forest environments, being registered in the states of São Paulo, Rio Grande do Sul, and Minas Gerais Pedrotti et al. (2011); this study obtained the same high record, a fact that corroborates with the presence of Atlantic Forest patches of vegetation in the studied sites.

There are no records of inventories for the Espinhaço mountain range within the state of Minas Gerais: this is the first published inventory for the region. This study and the only study in the Serra do Espinhaço about butterflies, conducted in Chapada Diamantina in Bahia - Brazil by Zacca and Bravo (2012) had similar predominance of species belonging to the family Nymphalidae. The species shared among these two studies are: *Adelpha pleasure*, *Archaeoprepona demophon*, *Ascia monuste*, *Callicore sorana*, *Colobura dirce*, *Dryas iulia*, *Eresia lansdorfi*, *Eryphanis reevesii*, *Eurema albula*, *Eurema elathea*, *Hamadryas amphinome*, *Hamadryas februa*, *Hamadryas feronia*, *Heliconius erato*, *Heliconius ethilla*, *Junonia evarete*, *Leptotes cassius*, *Pareuptychia ocirrhoe*, *Pyrgus orcus*, *Prepona laertes*, *Siproeta stelenes*, *Smyrna blomfildia*, *Taygetis laches*, *Temenis laothoe*, *Zaretis itys*, and *Yphthimoides straminea*.

It is emphasized that in this study the majority of butterflies species captured are typical of Cerrado and Atlantic Forest (Emery et al. 2006, Brown Jr. and Freitas 2000b).

Further investigation on biodiversity should be conducted and motivated in this region. The group of Lepidoptera showed great research and conservation potential for the Serra do Intendente State Park. The biodiversity information should be made available for decision

makers, specially for regions such as the one studied, which is currently threatened by mining, tourism, and housing developments.

Acknowledgements

The authors thank the biologists André Freitas and Ana Beatriz Borges for their attention and help in the determination of genera and species of butterflies, Diogo França for his help and contributions in the field work, and Miguel Andrade for his attention and for providing workplace, the members of the Invertebrates Laboratory of PUC Minas – Alex Souza, Isabela Rocha and Nathalia Melgaço for their assistance in the execution stages of this study and PROBIC – FAPEMIG and IEF for the opportunity to accomplish this study and for collecting permits. We thanks José Apezteguia for the mapping of the area. We also would like to thank Dr. Tadeu Guerra for putting together essential parts for the realization of this research and files assistance as well.

References

- Andrade MA, Domingues SA (2013) Serra do Espinhaço. 1, 1. Empresa das Artes, 214 pp.
- Araujo AO, Souza VC, Chautems A (2005) Gesneriaceae da Cadeia do Espinhaço de Minas Gerais, Brasil. Revista Brasileira de Botânica 28 (1): 109-135.
- Bogiani PA, Aranda R, Machado COF (2012) Riqueza de borboletas (Lepidoptera) em um fragmento urbano de Cerrado em Mato Grosso do Sul, Brasil. Entomobrasilis 5 (2): 93-98. DOI: 10.12741/ebrasilis.v5i2.204
- Bonfantti D, Leite LAR, Carlos MM, Casagrande MM (2011) Riqueza de borboletas em dois parques urbanos de Curitiba, Paraná, Brasil. Biota Neotropica 11 (2): 247-253. DOI: 10.1590/S1676-06032011000200025
- Brown Jr. KS, Freitas AV (1999) Invertebrados Terrestres: Lepidoptera. In: Joly CA, Bicudo CE (Eds) Biodiversidade do Estado de São Paulo: síntese do conhecimento ao final do século XX. FAPESP, São Paulo, 226-243 pp. [In Portuguese].
- Brown Jr. KS, Freitas AV (2000a) Diversity of Lepidoptera in Santa Teresa, Espírito Santo, Brazil. Boletim do Museu de Biologia Mello Leitão 11/12: 71-116.
- Brown Jr. KS, Freitas AV (2000b) Atlantic forest Butterflies: Indicators for Landscape Conservation. Biotropica 32 (4): 934-956. DOI: 10.1646/0006-3606(2000)032[0934:AFBIFL]2.0.CO;2
- Brown Jr. KS, Hutchings RW (1997) Disturbance, fragmentation, and the dynamics of diversity in Amazonian forest butterflies. In: Laurence WF, Jr B (Eds) Tropical Forest remnants: ecology, management and conservation of fragmented communities. University of Chicago Press, Chicago, 91-110 pp. [In English].
- Casagrande MM, Mielke OH, Brown Jr. KS (1998) Borboletas (Lepidoptera) ameaçadas de extinção em Minas Gerais, Brasil. Revista Brasileira de Biologia 15 (1): 241-259.
- D'Abrera B (1987a) Part III. Brassolidae, Achaeidae and Nymphalidae. Butterflies of the Neotropical region. Hill House, Victoria, 528-678 pp.

- D'Abrera B (1987b) Part IV. Nymphalidae. Butterflies of the Neotropical region. Hill House, Victoria, 386-525 pp.
- D'Abrera B (1988) Part V. Nymphalidae and Satyridae. Butterflies of the Neotropical region. Hill House, Victoria, 680-877 pp.
- Dessuy MB, Morais ABB (2007) Diversidade de borboletas (Lepidoptera, Papilionoidea e Hesperioidea) em fragmentos de Floresta Estacional Decidual em Santa Maria, Rio Grande do Sul, Brasil. Revista Brasileira de Zoologia 24 (1): 108-120. DOI: 10.1590/S0101-81752007000100014
- Devries PJ (1997) Butterflies of Costa Rica and Their Natural History: papilionidae, pieridae, nymphalidae. Princeton University Press, Princeton, NJ, 327 pp.
- Devries PJ, Walla TR (2001) Species diversity and community structure in neotropical fruit- feeding butterflies. Biological journal of the Linnean Society 74 (1): 1-5. DOI: 10.1111/j.1095-8312.2001.tb01372.x
- Dolibaina DR, Mielke OH, Casagrande MM (2011) Butterflies (Papilionidae and Hesperiidae) from Guarapuava and vicinity, Paraná, Brazil: an inventory based on records of 63 years. Biota Neotropica 11 (1): 341-354. DOI: 10.1590/S1676-06032011000100031
- Emery EO, Brown Jr. KS, Pinheiro CEG (2006) As borboletas (Lepidoptera, Papilionoidea) do Distrito Federal, Brasil. Revista Brasileira de Entomologia 50 (1): 85-92. DOI: 10.1590/S0085-56262006000100013
- Favretto MA (2012) Borboletas e Mariposas (Insecta: Lepidoptera) do Município de Joaçaba, Estado de Santa Catarina, Brasil. EntomoBrasilis 5 (2): 167-169. DOI: 10.12741/ebrasilis.v5i2.200
- Freitas AV, Francini RB, Brown Jr. KS (2003) Insetos como indicadores ambientais. In: Cullen Jr. L, Rudran R, Valladares-Padua C (Eds) Métodos de estudos em biologia da conservação e manejo da vida silvestre. Editora UFPR, 125-152 pp. [In Portuguese]. [ISBN 85-7335-114-4].
- Freitas AVL, Marini-Filho OJ (2011) Plano de Ação Nacional para a Conservação dos Lepidópteros Ameaçados de Extinção. Série Espécies Ameaçadas nº13. Instituto Chico Mendes de Conservação da Biodiversidade, ICMBio, 124 pp.
- Heppner JB (1991) Faunal regions and the diversity of Lepidoptera. Tropical Lepidoptera 2: 1-85.
- Isehard CA, Romanowski HP (2004) Lista de espécies de borboletas (Lepidoptera, Papilionoidea e Hesperioidea) da região do vale do rio Maquiné, Rio Grande do Sul, Brasil. Revista Brasileira de Zoologia 21 (3): 649-662. DOI: 10.1590/S0101-81752004000300027
- Isehard CA, Romanowski HP, Mendonça MS (2007) Diversidade de borboletas (Lepidoptera, Papilionoidea) na floresta nacional de São Francisco de Paula, Rio Grande do Sul, Brasil. In: Sociedade de Ecologia do Brasil Anais do VIII Congresso de Ecologia do Brasil. Caxambu, 2 pp.
- Isehard CA, Quadros MTD, Romanowski HP, Mendonça MS (2010) Borboletas (Lepidoptera: Papilionoidea e Hesperioidea) ocorrentes em diferentes ambientes na floresta Ombrófila Mista e nos Campos de Cima da Serra do Rio Grande do Sul, Brasil. Biota Neotropica 10 (1): 309-320. DOI: 10.1590/S1676-06032010000100026
- Marchiori MO, Romanowski HP (2006) Borboletas (Lepidoptera: Papilionoidea e Hesperioidea) do Parque Estadual que Estadual do Espinilho e entorno, Rio Grande do

Sul, Brasil. Revista Brasileira de Zoologia 23 (4): 1029-1037. DOI: 10.1590/S0101-81752006000400007

- Mielke OHH, Casagrande MM (1997) Papilionoidea and Hesperioidea (Lepidoptera) of the Parque Estadual do Morro do Diabo, Teodoro Sampaio, São Paulo, Brazil. Revista Brasileira de Zoologia 14 (4): 967-1001. DOI: 10.1590/S0101-81751997000400013
- Mielke OHH, Emery EO, Pinheiro CEG (2008) As borboletas Hesperiidae (Lepidoptera, Hesperioidea) do Distrito Federal, Brasil. Revista Brasileira de Entomologia 52 (2): 283-288. DOI: 10.1590/S0085-56262008000200008
- Motta PC (2002) Butterflies from the Uberlândia region, central Brazil: species list and biological comments. Brazilian Journal of Biology 62 (1): 151-163. DOI: 10.1590/S1519-69842002000100017
- Öckinger E, Eriksson AK, Smith HG (2006) Effects of grassland abandonment, restoration and management on butterflies and vascular plants. Biological Conservation 133 (3): 291-300. DOI: 10.1016/j.biocon.2006.06.009
- Paluch M, Mielke OHH, Nobre CEB, Casagrande MM, Melo DHA, Freitas AVL (2011) Butterflies (Lepidoptera: Papilionoidea and Hesperioidea) of the Parque Ecológico João Vasconcelos Sobrinho, Caruaru, Pernambuco, Brazil. Biota Neotropica 11 (4): 229-238. DOI: 10.1590/S1676-06032011000400020
- Pedrotti VS, Barros MPD, Romanowski HP, Iserhard CA (2011) Borboletas frugívoras (Lepidoptera: Nymphalidae) ocorrentes em um fragmento de Floresta Ombrófila Mista no Rio Grande do Sul, Brasil. Biota Neotropica 11 (1): 385-390. DOI: 10.1590/S1676-06032011000100036
- Pinheiro CEG, Emery EO (2006) The butterflies (Lepidoptera: Papilionoidea and Hesperioidea) of the Environmental Protection Zone/APA do Gama e Cabeça de Veado, Distrito Federal, Brazil. Biota Neotropica 6 (3): 0-0.
- Pinheiro CEG, Malinov IC, Andrade TO, Maravalhas JB, Andrade MBMD, Deus LPAD, Zanatta GV (2008) The butterflies (Lepidoptera, Papilionoidea) of the University Campus Darcy Ribeiro (Distrito Federal, Brasil). Biota Neotropica 8 (4): 0-0.
- Ramos Soares G, Paiva de Oliveira AA, Melo Silva AR (2012) Borboletas (Lepidoptera: Papilionoidea e Hesperioidea) de um parque urbano em Belo Horizonte, Minas Gerais, Brasil. Biota Neotropica 12 (4): 01-09.
- Ritter CD, Lemes R, Morais A, Dambrios C (2011) Borboletas (Lepidoptera: Hesperioidea e Papilionoidea) de fragmentos de Floresta Ombrófila Mista, Rio Grande do Sul, Brasil. Biota Neotropica 11 (1): 309-320. DOI: 10.1590/S1676-06032011000100033
- Rosa PLP, Chiva EQ, Isehard CA (2011) Borboletas (Lepidoptera: Papilionoidea e Hesperioidea) do Sudoeste do Pampa Brasileiro, Uruguaiana, Rio Grande do Sul, Brasil. Biota Neotropica 11 (1): 355-360. DOI: 10.1590/S1676-06032011000100032
- Santana VTP (2005) Estudo preliminar das borboletas frugívoras (Papilionoidea e Hesperioidea) do Parque Municipal do Bacaba, Nova Xavantina, MT. Universidade do Estado de Mato Grosso, 27 pp.
- Silva AC, Horák I, Vidal-Torrado P, Cortizas AM, Racedo JR, Campos JRDR (2009) Turfeiras da Serra do Espinhaço Meridional-MG. II-Influência da drenagem na composição elementar e substâncias humicas. Revista Brasileira de Ciências do Solo 33: 1399-1408. DOI: 10.1590/S0100-06832009000500031
- Silva ARM, Landa GG, Vitalino RF (2007) Borboletas (Lepidoptera) de um fragmento de mata urbano em Minas Gerais, Brasil. Lundiana 8 (2): 137-142.

- Silva ARM, Castro COD, Mafia PO, Mendonça MOC, Alves TCC, Beirão MDV (2012) Borboletas frugívoras (Lepidoptera: Nymphalidae) de uma área urbana (Área de Proteção Especial Manancial Cercadinho) em Belo Horizonte, Minas Gerais, Brasil. Biota Neotropica 12 (3): 292-297. DOI: 10.1590/S1676-06032012000300028
- Silva ARM, Guimarães MPM, Vitalino RF, Bagni ÂS, Martins YE, Cordeiro AM, Oliveira EG (2010) Borboletas frugívoras do Parque Estadual do Rio Doce/MG. Biota MG: Instituto Estadual de Florestas-MG 3 (4): 05-21.
- Triplehorn CA, Johnson NF (2011) Estudo dos Insetos. Cengage Learning, 809 pp.
- Uehara-Prado M, Brown Jr. KS, Freitas AVL (2007) Species richness, composition and abundance of fruit-feeding butterflies in the Brazilian Atlantic Forest: comparison between a fragmented and a continuous landscape. Global Ecology and Biogeography 16 (1): 43-54. DOI: 10.1111/j.1466-8238.2006.00267.x
- Wilson EO (1997) A situação da biodiversidade biológica. In: Fronteira N (Ed.) Biodiversidade.
- Zacca T, Bravo F (2012) Borboletas (Lepidoptera: Papilionoidea e Hesperioidea) da porção norte da Chapada Diamantina, Bahia, Brasil. Biota Neotropica 12 (2): 117-126. DOI: 10.1590/S1676-06032012000200012
- Zhang ZQ (2011) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. Magnolia Press, 237 pp.